Space Weather Forecast

Issued on Tuesday, 23 July 2024 at 01:11 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Minor Geomagnetic Storm G1 likely today. Moderate G2 likely in UTC day of Wednesday 24 July, chance of Strong G3. Minor radio blackouts R1 likely throughout.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Activity was Moderate, with occasional Moderate-class X-ray flares observed that peaked with an event at 22/0404UTC from a developing sunspot region in the southeast.

There are currently up to nine regions on the facing side of the Sun, with two new groups both rotating onto the eastern solar horizon in the period as a third departed the west. Changes in the period were generally slower and more modest than over the past UTC weekend.

There was no evidence of new Earth-directed Coronal Mass Ejections (CMEs) seen in the period, however there was a large narrowly far-sided event from the southeastern solar horizon that dominated satellite imagery during the UTC evening. This feature plays no part in the forecast.

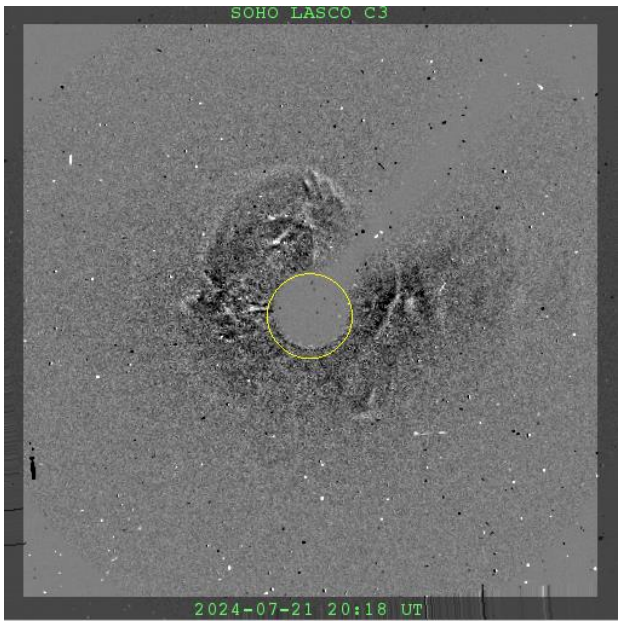

Figure 1: Satellite difference imagery of the 21 July 'filament lift-off' CME showing a north-shifted 'full halo' (the black and white ring almost completely circumscribing the centre of the image. This is a common signature of Earth-directed CMEs, whereby the usual 'lightbulb' shape of side-on and non-Earth directed CMEs is instead viewed from the 'top', i.e. as an expanding ring of ejecta heading towards the observer. This feature is due to reach Earth during the early hours UTC of 24 July.

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Solar Wind / Geomagnetic Activity: There are some signs on instruments that a CME may shortly be inbound, with this feature very possibly the 19 July CME. This will become clearer in the coming hours. The solar wind otherwise showed a continuation of a slow regime, albeit with an unusually stable and anti-aligned (with Earth's field) magnetic field component, showing a gradual rise to become slightly elevated into the UTC evening. The solar wind speed was more subdued, as was the number of particles in the wind.

The net result of the above solar wind measures was for mainly quiet geomagnetic indices throughout.

Energetic Particles / Solar Radiation: Solar radiation showed a slight rise in the period, beginning around 22/0600UTC. The causative mechanism is not clear - however the rise was gradual which perhaps implies a far-sided or eastern solar hemisphere source as being most likely, which might point at the trio of Moderate-class flares from the southeast as being the most likely culprits. Even at peak, the flux was less than 0.5pfu (where S1 is 10pfu), but this may may make the southeastern sunspot region one to watch as it crosses the Sun.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate activity is likely throughout. While a particularly active sunspot region has now departed the facing side, its loss is in some way compensated for by the flaring into life of a second group in the southeast.

Solar Wind /Geomagnetic Activity: No fast winds feature in the forecast period. Two CMEs are expected - the first from a 'filament eruption' (arc of plasma) that left the Sun on 19 July which is due inside the first 24 hours - this is likely to give Minor Geomagnetic Storm G1 conditions. Secondly, a CME that left the Sun on 21 July is due in the early hours of 24 July. This is Likely to give Moderate Geomagnetic Storm G2 conditions, with a chance of Strong G3 in the UTC day of 24 July. A gradual decline to quiet geomagnetic activity is then expected into the second half of the UTC working week, barring new CMEs.

Energetic Particles / Solar Radiation: Solar radiation is most likely to remain at Background levels, but with a slight chance of rising above the S1/Minor Storm threshold in response to any notable flares - perhaps now increasingly likely from the active region in the southeast as it tracks westwards.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	50	70	20	1
Strong	G3	No	10	30	1	1
Severe	G4	No	1	2	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	60	60	60	60
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	10	15	15
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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